

# -100V, -23A, 49.5mΩ P-channel Power SGT MOSFET

## JMPL1050PKQ

### Features

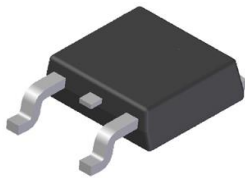
- Ultra-low ON-resistance,  $R_{DS(ON)}$
- Low Gate Charge
- 100% UIS Tested
- 100%  $\Delta V_{ds}$  Tested
- Halogen-free; RoHS-compliant
- AEC-Q101 Qualified

### Applications

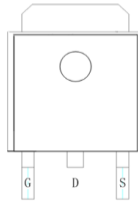
- Load Switch
- PWM Application
- General Automotive Application

### Product Summary

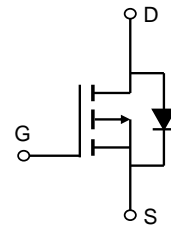
Parameters	Value	Unit
$V_{DSS}$	-100	V
$V_{GS(th\_Typ)}$	-1.7	V
$I_D(@V_{GS}=-10V)$	-23	A
$R_{DS(ON\_Typ)}(@V_{GS}=-10V)$	38.1	mΩ
$R_{DS(ON\_Typ)}(@V_{GS}=-4.5V)$	49.5	mΩ



TO-252-3L



Pin Assignment



Schematic Diagram

### Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JMPL1050PKQ-13	PL1050PQ	1	Tape&Reel	TO-252-3L	2500	25000

### Absolute Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-to-Source Voltage	-100	V
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$I_D$	Continuous Drain Current	$T_C = 25^\circ\text{C}$	-23
		$T_C = 100^\circ\text{C}$	-16
$I_{DM}$	Pulsed Drain Current <sup>(1)</sup>	Refer to Fig.4	A
$E_{AS}$	Single Pulsed Avalanche Energy <sup>(2)</sup>	144	mJ
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$	56
		$T_C = 100^\circ\text{C}$	28
$T_J, T_{STG}$	Junction & Storage Temperature Range	-55 to 175	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient <sup>(3)</sup>	45	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	2.7	

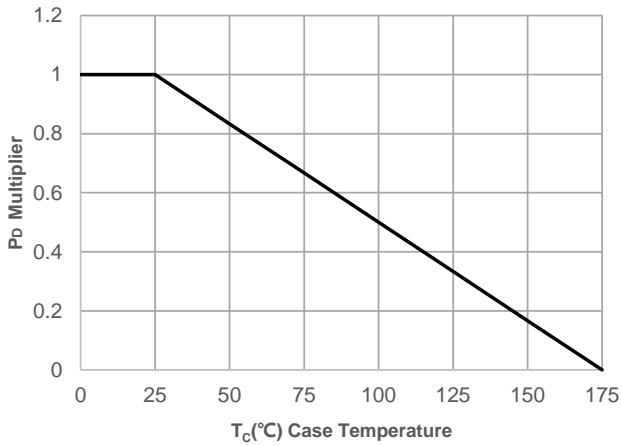
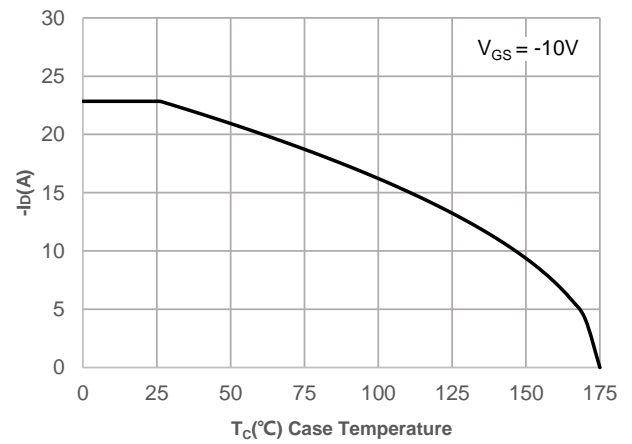
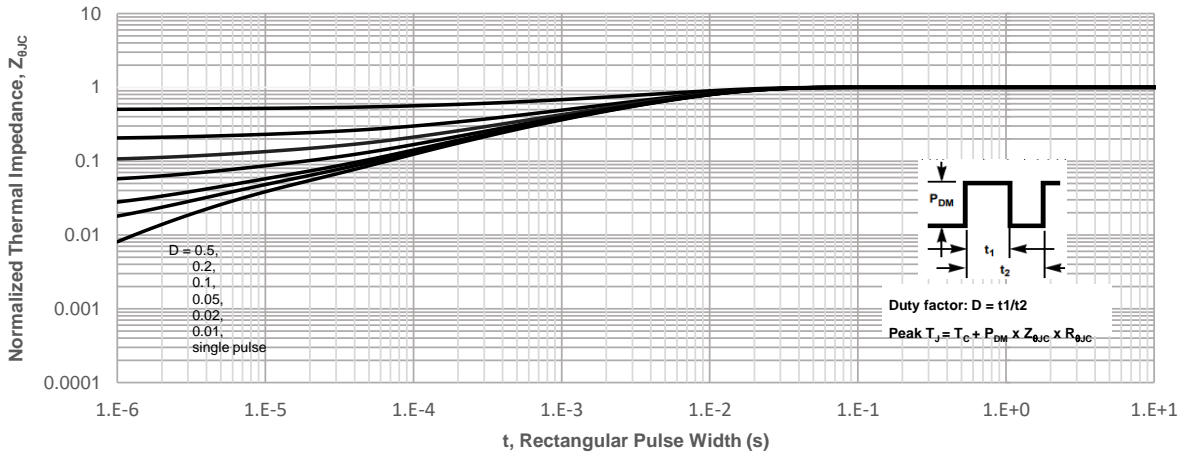
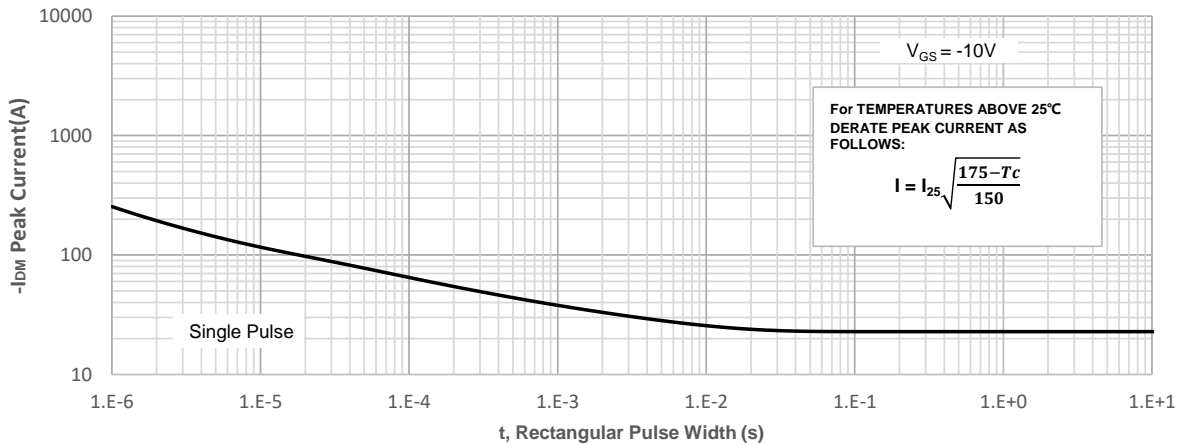
**Electrical Characteristics** ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$I_D = -250\mu\text{A}$ , $V_{GS} = 0\text{V}$	-100	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -80\text{V}$ , $V_{GS} = 0\text{V}$	-	-	-1.0	$\mu\text{A}$
$I_{GSS}$	Gate-Body Leakage Current	$V_{DS} = 0\text{V}$ , $V_{GS} = \pm 20\text{V}$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ , $I_D = -250\mu\text{A}$	-1.2	-1.7	-2.2	V
$R_{DS(ON)}$	Static Drain-Source ON-Resistance <sup>(4)</sup>	$V_{GS} = -10\text{V}$ , $I_D = -20\text{A}$	-	38.1	49.5	m $\Omega$
		$V_{GS} = -4.5\text{V}$ , $I_D = -15\text{A}$	-	49.5	64.3	m $\Omega$
<b>Dynamic Characteristics</b>						
$R_g$	Gate Resistance	$f = 1\text{MHz}$	-	7.3	-	$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS} = 0\text{V}$ , $V_{DS} = -50\text{V}$ , $f = 1\text{MHz}$	1069	1497	2021	pF
$C_{oss}$	Output Capacitance		193	271	365	pF
$C_{riss}$	Reverse Transfer Capacitance		13	19	25	pF
$Q_g$	Total Gate Charge	$V_{GS} = 0$ to $-10\text{V}$ $V_{DS} = -50\text{V}$ , $I_D = -20\text{A}$	18	25	34	nC
$Q_{gs}$	Gate Source Charge		-	6.4	-	nC
$Q_{gd}$	Gate Drain("Miller") Charge		-	4.9	-	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On DelayTime	$V_{GS} = -10\text{V}$ , $V_{DD} = -50\text{V}$ $I_D = -20\text{A}$ , $R_{GEN} = 3\Omega$	-	7	-	ns
$t_r$	Turn-On Rise Time		-	6	-	ns
$t_{d(off)}$	Turn-Off DelayTime		-	34	-	ns
$t_f$	Turn-Off Fall Time		-	11	-	ns
<b>Body Diode Characteristics</b>						
$I_S$	Maximum Continuous Body Diode Forward Current		-	-	-23	A
$I_{SM}$	Maximum Pulsed Body Diode Forward Current		-	-	-91	A
$V_{SD}$	Body Diode Forward Voltage	$V_{GS} = 0\text{V}$ , $I_S = -20\text{A}$	-	-	-1.2	V
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F = -20\text{A}$ , $di/dt = 100\text{A/us}$	37	52	70	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge		-	139	-	nC

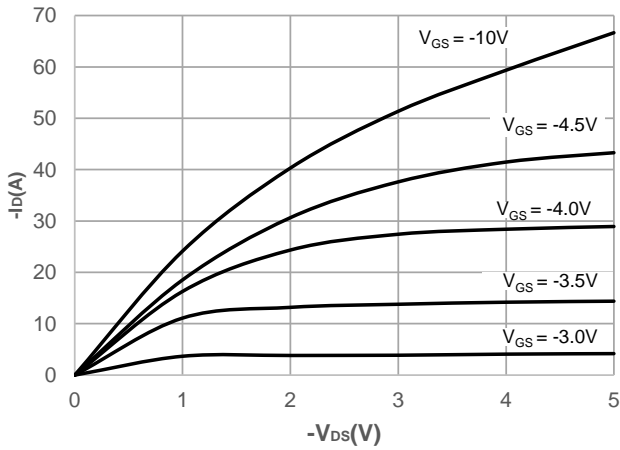
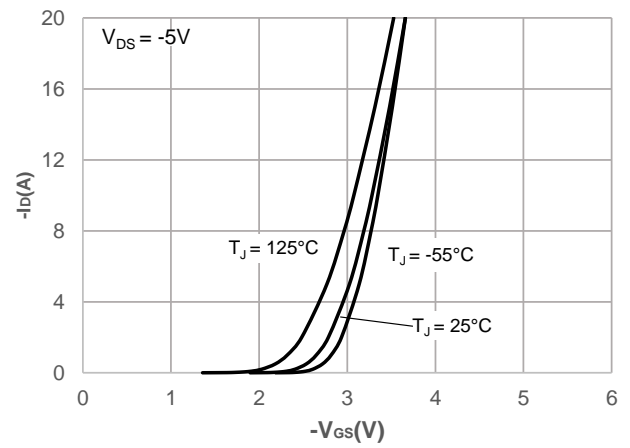
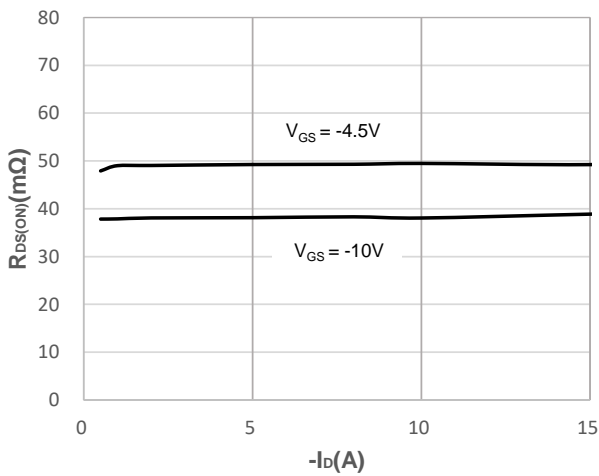
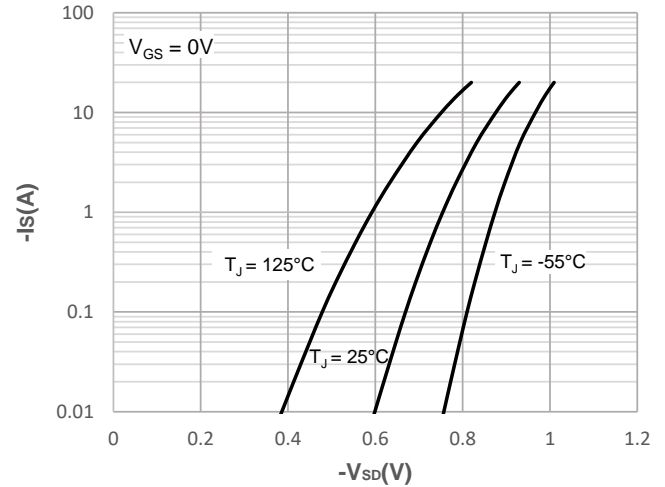
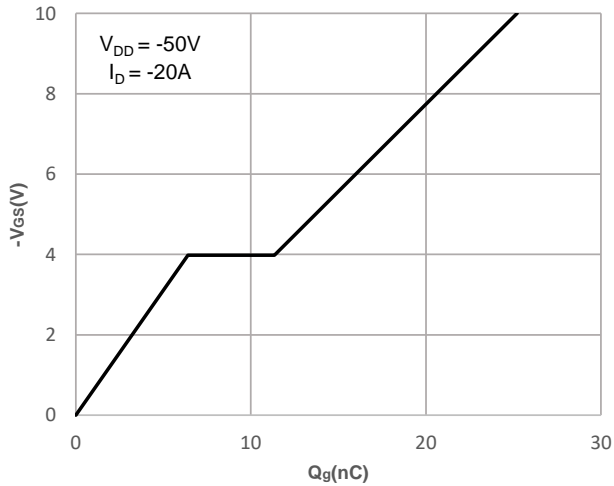
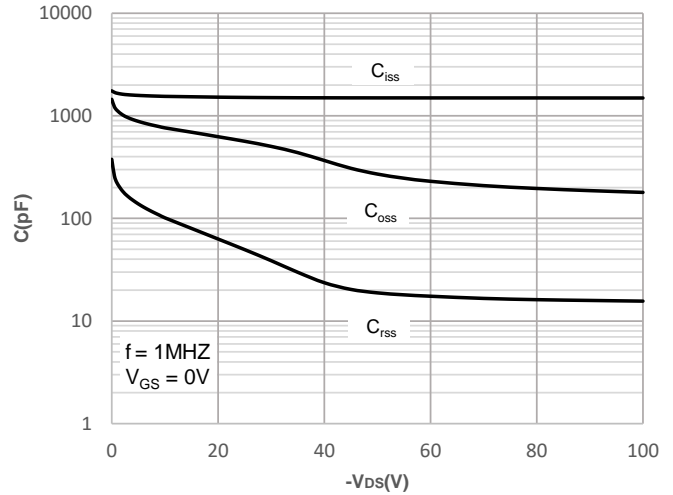
- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
  2.  $E_{AS}$  condition: Starting  $T_J = 25^\circ\text{C}$ ,  $V_{DD} = -50\text{V}$ ,  $V_{GS} = -10\text{V}$ ,  $R_G = 25\text{ohm}$ ,  $L = 3\text{mH}$ ,  $I_{AS} = -9.8\text{A}$ ,  $V_{DD} = 0\text{V}$  during time in avalanche.
  3.  $R_{\theta JA}$  is measured with the device mounted on a 1inch<sup>2</sup> pad of 2oz copper FR4 PCB.
  4. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 0.5\%$ .



## Typical Performance Characteristics

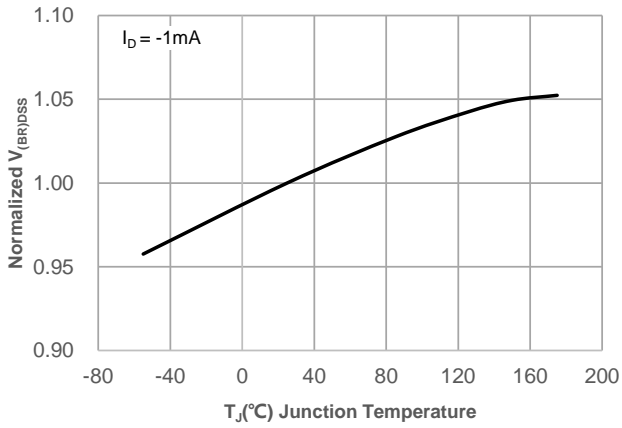
**Figure 1: Power De-rating**

**Figure 2: Current De-rating**

**Figure 3: Normalized Maximum Transient Thermal Impedance**

**Figure 4: Peak Current Capacity**


## Typical Performance Characteristics

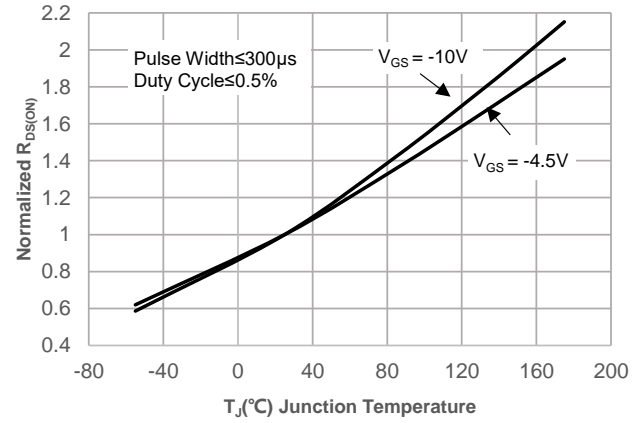
**Figure 5: Output Characteristics**

**Figure 6: Typical Transfer Characteristics**

**Figure 7: On-resistance vs. Drain Current**

**Figure 8: Body Diode Characteristics**

**Figure 9: Gate Charge Characteristics**

**Figure 10: Capacitance Characteristics**


## Typical Performance Characteristics

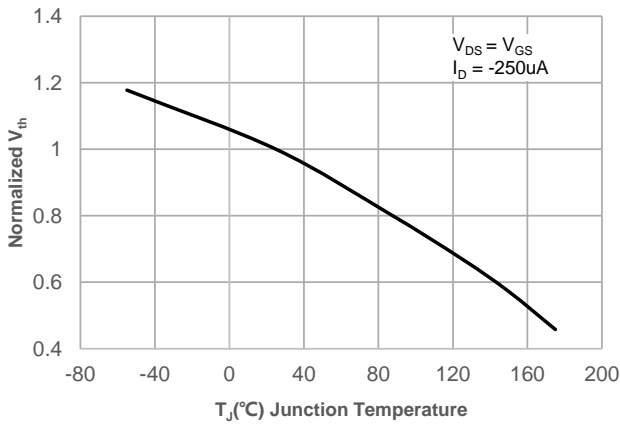
**Figure 11: Normalized Breakdown voltage vs. Junction Temperature**



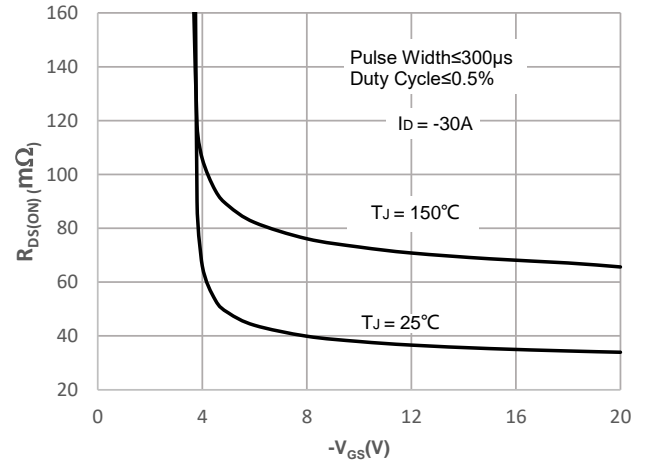
**Figure 12: Normalized on Resistance vs. Junction Temperature**



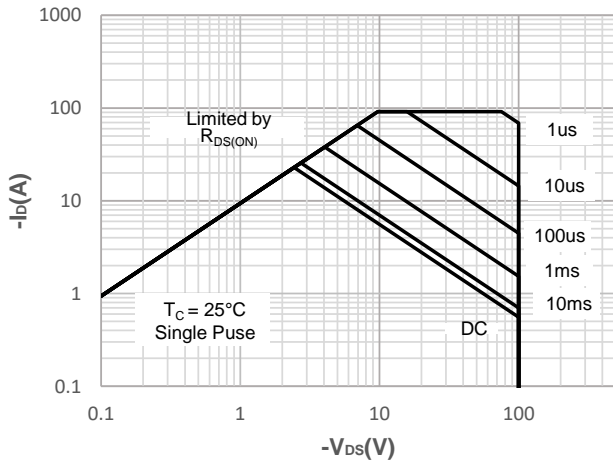
**Figure 13: Normalized Threshold Voltage vs. Junction Temperature**

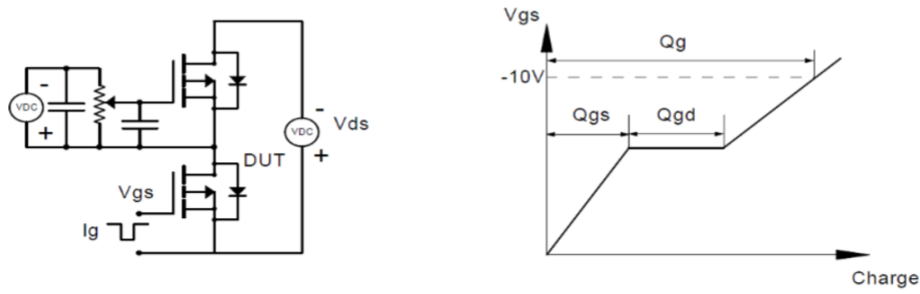
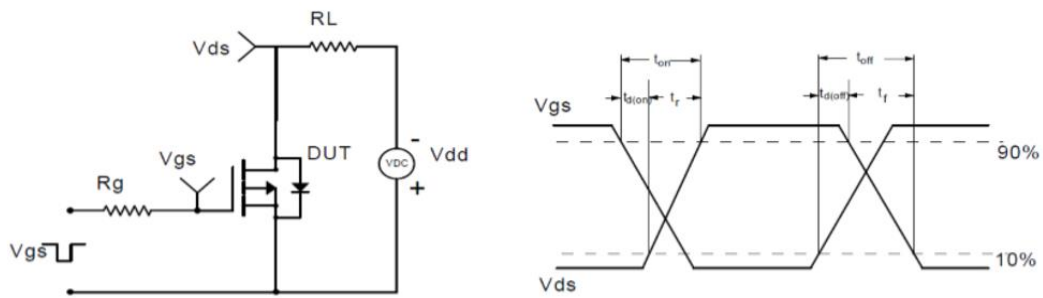
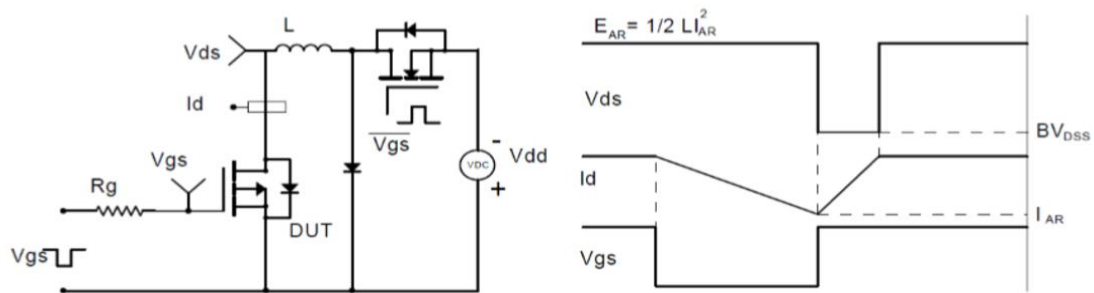
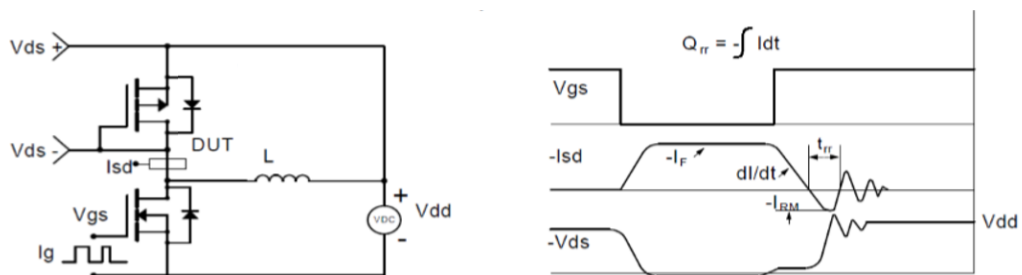


**Figure 14: R\_{DS(ON)} vs. V\_{GS}**



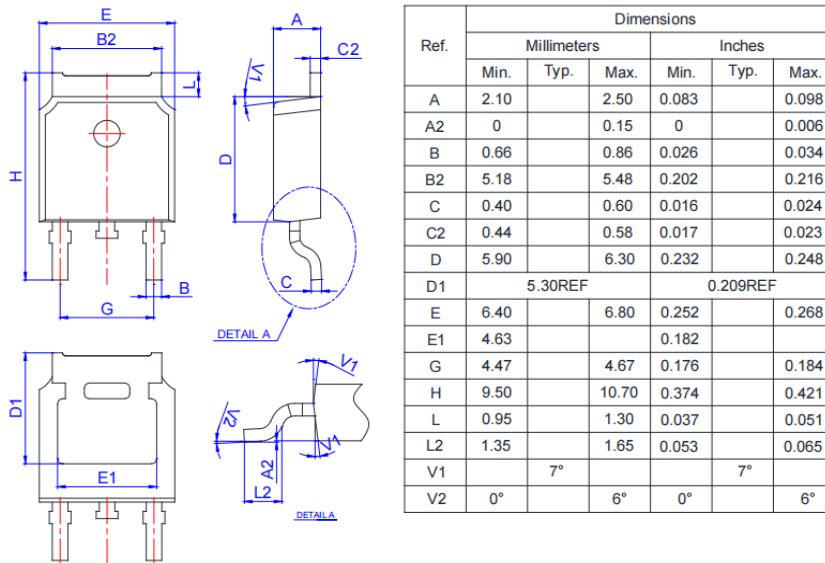
**Figure 15: Maximum Safe Operating Area**



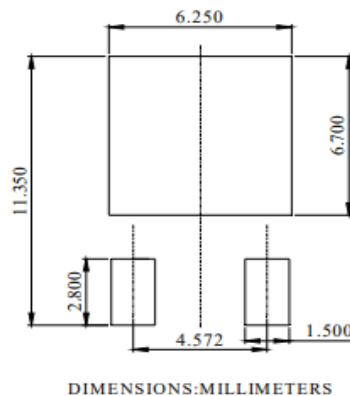
**Test Circuit**

**Figure 1: Gate Charge Test Circuit & Waveform**

**Figure 2: Resistive Switching Test Circuit & Waveform**

**Figure 3: Unclamped Inductive Switching Test Circuit & Waveform**

**Figure 4: Diode Recovery Test Circuit & Waveform**

## Package Mechanical Data(TO-252-3L)

### Package Outline



### Recommended Soldering Footprint



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